D E C L A R A T I O N

I, Yasuhiro YAMAZOE of Room 408, Kuleru-Toyonaka, 11-22, Hotarugaikenishimachi 2-chome, Toyonaka-shi, Osaka 560-0036 Japan hereby declare that I am conversant with the Japanese language and that I am the translator of the document attached and certify that to the best of my knowledge and belief the following is a true and correct English translation of the specification contained in the Priority Document No. 2002-206795.

This 1st day of September 2006

Yasuhiro Yamazoe

Yasuhiro YAMAZOE

2002-206795
(Translation)

[DOCUMENT NAME] Patent Application
[REFERENCE NUMBER] 2205040103
[DATE OF SUBMISSION] Heisei 14 (2002), July 16th
[ADDRESSEE] To: The Commissioner of the Patent Office
[INTERNATIONAL PATENT CLASSIFICATION] B25F 5/00
H01M 2/10
[INVENTOR]
[DOMICILE OR RESIDENCE] c/o Matsushita Electric Industrial Co., Ltd. 1006, Oaza-Kadoma, Kadoma-shi, Osaka
[NAME] Shinji MURASHIGE
[INVENTOR]
[DOMICILE OR RESIDENCE] c/o Matsushita Electric Industrial Co., Ltd. 1006, Oaza-Kadoma, Kadoma-shi, Osaka
[NAME] Futoshi TANIGAWA
[PATENT APPLICANT]
[ID NUMBER] 000005821
[NAME OR CORPORATE NAME] Matsushita Electric Industrial Co., Ltd.
[ATTORNEY]
[ID NUMBER] 100097445
[PATENT ATTORNEY]
[NAME OR CORPORATE NAME] Fumio IWAHASHI
[SELECTED ATTORNEY]
[ID NUMBER] 100103355
[PATENT ATTORNEY]
[NAME OR CORPORATE NAME] Tomoyasu SAKAGUCHI
[SELECTED ATTORNEY]
[ID NUMBER] 100109667
[PATENT ATTORNEY]
[NAME OR CORPORATE NAME] Hiroki NAITO

[INDICATION OF OFFICIAL CHARGE]

[NUMBER IN PRE-PAYMENT REGISTER] 011305

[AMOUNT PAID] ¥21,000

[LIST OF DOCUMENTS SUBMITTED]

[TITLE OF DOCUMENT]	Specification	1
[TITLE OF DOCUMENT]	Drawing	1
[TITLE OF DOCUMENT]	Abstract	1

[NUMBER OF GENERAL POWER OF ATTORNEY] 9809938

2002-206795

(Translation)

[DOCUMENT NAME] Specification

[TITLE OF THE INVENTION] PORTABLE POWER SOURCE SYSTEM

[CLAIMS]

[Claim 1] A portable power source system comprising a battery pack as a power source constituted of a plurality of secondary batteries, said battery pack being replaceably connected to a power using equipment main body by virtue of a mounting structure, characterized in that

said battery pack comprises a charge circuit having a charge terminal and a discharge circuit having a discharge terminal, said charge circuit comprising a control circuit for controlling a voltage and a current during charging, and

said mounting structure includes an external terminal having a protruding shape disposed on said power using equipment main body and a discharge terminal having a concave shape disposed on said battery pack, and comprises a double action system in which connection is achieved by inserting said external terminal to the external terminal of said power using equipment main body and then rotating, or alternatively by inserting said external terminal and then sliding in a direction different from the insertion direction.

[Claim 2] The portable power source system in accordance with Claim 1, characterized in that said secondary battery is a lithium-ion secondary battery.

[Claim 3] The portable power source system in accordance with Claim 1, characterized in that said charge circuit further comprises a thermal protector in addition to the control circuit, and said discharge circuit does not comprise any kinds of current regulating device.

[Claim 4] The portable power source system in accordance with Claim 1, characterized in that with respect to said charge terminal and said discharge terminal, negative electrode terminals thereof are mutually electrically independent and a positive electrode terminal thereof is a commonly used terminal having an equivalent potential; and a thermistor terminal for temperature measurement of said battery pack is further provided.

[Claim 5] The portable power source system in accordance with Claim 1, characterized in that said negative electrode terminal and said positive electrode terminal for discharging are exclusively structured so as to be in a concave shape, and said mounting structure comprises said double action system.

[Claim 6] The portable power source system in accordance with Claim 1, characterized in that said power using equipment is an electric tool or an electric vacuum cleaner.

[Claim 7] The portable power source system in accordance with Claim 1, characterized in that said power using equipment is an electric bicycle or an electric

motorbike.

[DETAILED DESCRIPTION OF THE INVENTION]

[0001]

[Technical Field to Which the Invention Belongs]

The present invention relates to a portable power source system, and in particular, relates to a mounting structure of a power using equipment main body and a battery pack.

[0002]

[Prior Art]

Conventionally, as a power using equipment which uses a portable power source system, there are for example electric tools such as electric screwdrivers for use in the screw fastening work. The electric tools have been mainly used in construction sites and the like for business purpose since they can significantly improve work efficiency. The electric tools have recently been available at home improvement centers and the like and come to be generally used for do-it-yourself.

[0003]

There are however some cases where a construction site or the like is not wired. Further, the presence of cords or the like may negatively affect working performance. For this reason, a battery pack that is constituted of plural secondary batteries is typically employed as a power source in electric tools which operate at relatively low voltage, such

as screwdrivers. Such a battery pack is usually replaceable and charging is conducted by inserting the battery pack into a charger specific to the battery pack. On a construction site or the like, a spare battery pack is often prepared in order to continue the construction by replacing the battery pack when the capacity of the battery is run down halfway through the work.

[0004]

The battery pack (Model No. EZ9025) for the electric tool (DRILL & DRIVER, Model No. EZ6225) manufactured by Matsushita Electric Works, Ltd. is described as one of the examples of the conventional battery packs by reference to FIGS. 15 to 17.

[0005]

FIG. 15 is an oblique view of the battery pack (EZ9025), and FIG. 16 is a top plan view thereof. At the time of insertion of the battery pack into the electric tool main body, the battery pack is positioned by a guide 1 to be inserted, and then fixed to the electric tool with a latch 2. On the upper end of the battery pack disposed while being exposed to the outside are a positive electrode terminal 3 both for charging and discharging, a charge negative electrode terminal 4 specifically for charging, a discharge negative electrode terminal 5 specifically for discharging, and a thermistor terminal 6.

[0006]

FIG. 17 shows a circuit diagram of the battery pack (EZ9025). A discharge circuit comprising the positive electrode terminal 3, a secondary battery 7 and the discharge negative electrode terminal 5 is not provided with a current regulating device, whereas a charge circuit comprising the positive electrode terminal 3, the secondary battery 7 and the charge negative electrode 4 is provided with a control circuit 8 and a thermal protector 9, securing safety during charging. Further, a thermistor 10 is connected to the thermistor terminal 6. During charging, the temperature of the battery pack is monitored with resistance values of the thermistor 10 to control charging according to the monitored temperatures. The conventional battery pack comprises the current regulating device in the charge circuit in the battery pack since current continues to flow if the charger should suffer a breakdown. However, with respect to the discharge circuit, since there are cases where a heavy current temporarily flows and a total amount of the discharge current is regulated by the capacity of the secondary battery, the current regulating device is not provided.

[0007]

For the purpose of protecting external terminals including the positive electrode as mentioned above from external shock caused by dropping the battery pack and the like, there has been proposed a structure where an external terminal is provided on the portion of the inner

circumferential side of a lid facing the hollow portion so that the external terminal is protected from external shock and contact to the external terminal from the outside is made difficult (Japanese Laid-Open Patent Publication No. 2001-135287).

[0008]

[Problem That the Invention Is to Solve]

Nevertheless, in this battery pack, the external terminal is disposed on the inside thereof, but it is still in a state of exposure to the outside. Moreover, it is possible to charge the battery pack from a large-sized battery such as a battery for automobiles using a lead wire. In this case there has been a problem of an extreme danger when charged from the discharge terminal side because of the absence of the current regulating device.

[0009]

The present invention was made in view of the aforementioned problem and intends to provide a mounting structure in which connection with a discharge terminal is achieved only when a power using equipment is used, using a simplified configuration.

[0010]

[Means for Solving the Problem]

In order to solve the aforementioned problem, the present invention is characterized in that in a mounting structure of a battery pack and a power using equipment main

body, the mounting structure includes an external terminal having a protruding shape disposed on the power using equipment main body and a discharge terminal having a concave shape disposed on the battery pack, and comprises a double action system in which the terminals are connected by inserting the external terminal to the an external terminal of said power using equipment main body and then rotating, or alternatively by inserting the external terminal and then sliding in a direction different from the inserted direction.

[0011]

According to this structure, a lead wire and the like cannot be connected to the discharge terminal of the battery pack in the case where the power using equipment main body is not used.

[0012]

[Mode for Embodying the Invention]

The invention according to claim 1 of the present invention is a portable power source system comprising a battery pack as a power source constituted of a plurality of secondary batteries, the battery pack being replaceably connected to a power using equipment main body by virtue of a mounting structure, characterized in that the battery pack comprises a charge circuit having a charge terminal and a discharge circuit having a discharge terminal, the charge circuit comprising a control circuit for controlling a voltage and a current during charging; and the mounting structure

includes an external terminal having a protruding shape disposed on the power using equipment main body and a discharge terminal having a concave shape disposed on the battery pack, the mounting structure comprising a double action system in which the connection is achieved by inserting the external terminal to the external terminal of the power using equipment main body and then rotating, or alternatively by inserting the external terminal and then sliding in a direction different from the insertion direction.

[0013]

In this configuration, since the discharge terminal of the battery pack is of a concave shape so as not to be exposed to the outside, and a double action system, in which connection with the terminal is not achieved only by insertion of a component part having a protruding shape that fits to the terminal and subsequent rotation or sliding in a direction different from the insertion direction is necessary in order to achieve the connection, is employed, it is possible to avoid such dangerous operation as that of charging from the discharge terminal.

[0014]

The invention according to claim 2 of the present invention is characterized in that in the portable power source system in accordance with claim 1, the secondary battery is a lithium-ion secondary battery, and has an effect of protecting the lithium ion secondary battery susceptible to

overcharge.

[0015]

The invention according to claim 3 of the present invention is characterized in that in the portable power source system in accordance with claim 1, the charge circuit further comprises a thermal protector in addition to the control circuit, and the discharge circuit does not comprise any kinds of current regulating device, and has an effect of ensuring safety when charge is carried out using a lead wire and the like from the charge terminal that is exposed to the outside. As the thermal protector, a conventionally known product such as a thermostat, a PTC device and a temperature fuse can be used.

[0016]

In particular, the conventional configuration requires a current regulating device when the secondary battery is a lithium-ion secondary battery. It is therefore greatly advantageous that large current is available, while the discharge circuit does not need to comprise the current regulating device as in the configuration of the present invention.

[0017]

The invention according to claim 4 of the present invention is characterized in that in the portable power source system in accordance with claim 1, with respect to the charge terminal and the discharge terminal, negative electrode

terminals thereof are mutually electrically independent and a positive electrode terminal thereof is a commonly used terminal having an equivalent potential; and a thermistor terminal for measuring temperature of the battery pack is further provided. In this configuration, since the positive electrode terminal is commonly used, it is possible to reduce cost for machining, etc. Further, since the thermistor terminal is provided, it is possible to carry out charge while measuring temperatures of the battery pack during the charge. [0018]

The invention according to claim 5 of the present invention is, in the portable power source system in accordance with claim 1, the mounting structure in which the negative electrode terminal and the positive electrode terminal for discharging are exclusively structured so as to be in a concave shape and the double action system is employed. In other words, this is preferable because since the positive electrode terminal and the negative electrode terminal for charging have a conventional structure in which they are exposed to the outside, and can be connected with the terminals of a charger by means of a single action comprising insertion only. In this case, the positive electrode terminal may have an equivalent potential to the discharge positive electrode terminal for discharging and be a commonly used terminal. A specific embodiment includes a configuration in which a metal plate constituting a terminal has an L-shape in

the tip portion thereof and the tip portion is disposed in an invisible portion of the concave part of a groove for a terminal so that the tip portion serves as a discharge positive electrode terminal having a double action system, and a part of the metal plate is exposed to the outside at some point so that the part serves as a charge positive electrode terminal. According to this configuration, there is an effect in which a lead wire from the secondary battery and a metal plate can be constituted by a single component part.

[0019]

[Working Examples]

In the following, a description about Examples of the present invention is given by reference to the drawings.

[0020]

(Example 1)

In Example 1 of the present invention, an example in which a double-action system comprising insertion of an external terminal and subsequent rotation thereof is employed in an electric screwdriver as an electric tool is described.

[0021]

FIG. 1 is an oblique view of a battery pack in accordance with the present Example, and FIG. 2 is a top plan view thereof. FIG. 3 is an oblique view of an electric tool main body in accordance with the present Example. In FIG. 3, the electric tool main body comprises a driver bit 11, a driving part 12 and a battery pack holding part 13. FIG. 4 is

a vertical sectional view of the battery pack holding part 13. In FIG. 3, since an on/off switch, a selector switch and the like are not essential parts to the present invention, they are not shown.

[0022]

Lastly, FIG. 5 is a vertical sectional view of the battery pack holding part 13 when the battery pack has been connected to the electric tool main body.

[0023]

This battery pack comprises guides 1b and 1c for protection against reverse connection, the guides being designed to move in parallel with a guide groove 14 of the electric tool main body so that the operation of positioning as well as the double-action system in which insertion is followed by clockwise rotation can certainly be carried out. A latch 2b is also designed to lock with a clicking sound when rotated clockwise after insertion.

[0024]

The upper end of the battery pack is provided with a groove 15 for a discharge positive electrode terminal and a groove 16 for a discharge negative electrode terminal; a discharge positive electrode terminal 3a and a discharge negative electrode terminal 5a, which are made of a metal plate and are concealed in the inside thereof, the grooves and the terminals being designed to be connected by the double-action system; and a charge positive electrode terminal 3b and

a charge negative electrode terminal 4, which are designed to be connected in the conventional manner comprising insertion only. Herein, the charge positive electrode terminal 3b is a part of the metal plate constituting the discharge positive electrode terminal 3a, the part being exposed to the outside. The charge positive electrode terminal 3b and the discharge positive electrode terminal 3a are connected each other and have an equivalent potential. The battery pack of the present Example also houses a thermistor, wherein a thermistor terminal 6 thereof is provided.

[0025]

As shown in FIG. 4, a positive electrode terminal 17 and a negative electrode terminal 18 that are disposed in the side of the electronic tool main body are in L-shape and they are first inserted into the wider portions of the groove 15 for a discharge positive electrode terminal and the groove 16 for a discharge negative electrode terminal, and then subsequent rotation allows them to be connected with the discharge positive electrode terminal 3a and the discharge negative electrode terminal 5a that are disposed in the narrower portions as shown in FIG. 5. Herein, connection of the terminals is ensured by means of a spring 19 in order to prevent connection failure.

[0026]

It should be noted that the battery pack of the present Example houses, in addition to a secondary battery 7,

a control circuit, a thermistor and a thermal protector, and the wiring of an internal circuit 20 including those parts mounted on one printed circuit board is the same as that of the conventional battery pack shown in FIG. 17.

[0027]

As obvious from FIG. 2, in the present Example, the discharge positive electrode terminal 3a and the discharge negative electrode terminal 5a cannot be connected with a lead wire because of complete concealment of the terminals 3a and 5a from the outside. It is therefore impossible to carry out charge from a large-sized battery such as a battery for automobiles using a lead wire.

[0028]

FIG. 6 shows an oblique view of a charger of the present Example. In FIG. 6, since an on/off switch, a charged-state indication light and the like are not essential parts to the present invention, they are not shown. In FIG. 6, 17b denotes a positive electrode terminal, 18b denotes a negative electrode terminal and 6b denotes a thermistor terminal, which are respectively connected to the positive electrode terminal 3b, the charge negative electrode terminal 4, the thermistor terminal 6 when the battery pack is inserted in the charger while fitting the guide 1b of the battery pack to a guide groove 14b.

[0029]

As mentioned above, in the present Example, there is

an effect of simplifying operation since connection with the terminals of the charger is achieved by a single action comprising insertion only.

[0030]

It is to be noted that, although the electric tool was exemplified in the present Example, a similar effect can be obtained in the case where the power using equipment is an electric vacuum cleaner, as long as the battery pack holding part is similarly structured to the present Example.

[0031]

(Example 2)

In Example 2 of the present invention, an example in which a double action system comprising insertion of an external terminal and subsequent sliding thereof in a direction perpendicular to the inserting direction is employed in an electric bicycle is described.

[0032]

FIG. 7 is a side view of the electric bicycle in accordance with the present Example. A battery pack 23 is disposed on the back of a sheet tube 22 supporting a saddle 21 via a mounting part 24. An antitheft key 25 is used for detachment of the battery pack 23.

[0033]

FIG. 8 is an oblique view of the battery pack 23 in accordance with the present Example, and FIG. 9 is an oblique view of the mounting part 24. A guide groove 26 is provided

in each long side face of the battery pack 23. The battery pack 23 is first attached vertically to the mounting face using guides 27 of the mounting part 24, and is subsequently slid in parallel with the mounting face. Fastening by the double action system is thus achieved. Further, on the bottom face of the battery pack 23 provided are total six concave parts: a concave part 28a for a charge positive electrode terminal, a concave part 28b for a charge negative electrode terminal, a concave part 28c for a thermistor terminal, a concave part 28d for a discharge positive electrode terminal, a concave part 28e for a discharge negative electrode terminal and a locking concave part 28f. Further, on the mounting face of the mounting part 24 provided are a hook window 29, and a positive electrode terminal 30 and a negative electrode terminal 31, which are in L-shape.

[0034]

FIG. 10 is a bottom view of the battery pack 23 of the present Example. FIG. 11 is a sectional view on the line A-A of FIG. 10. On the bottom face of the three concave parts, that are, the concave part 28a for a charge positive electrode terminal and the concave part 28b for a charge negative electrode terminal and the concave part 28c for a thermistor terminal, the terminals are exposed to the outside. A blind plate 32 is provided each on the concave part 28d for a discharge positive electrode terminal and the concave part 28e for a discharge negative electrode terminal so that the

exposure to the outside of the discharge positive electrode terminal 33 and the discharge negative electrode terminal 34 can be avoided. The locking concave part 28c is divided by a partition 35 into two portions.

[0035]

The case where the battery pack 23 is mounted on an electric car is specifically described by further reference to FIG. 12 to FIG. 14.

[0036]

FIG. 12 shows a top plan view of the battery pack 23 when connected to the mounting part 24. The guide grooves 26 and the guides 27 are fitted to each other in this figure, and they are not shown accordingly. FIG. 13 is a sectional view on the line B-B of FIG. 12, FIG. 14 (a) is a sectional view on the line C-C, and FIG. 14 (b) is a sectional view on the line D-D.

[0037]

In FIG. 13, a locking system 36 comprises a cylinder 38 supported by a spring 37; and a hook 39, in which sliding the battery pack 23 causes the hook 39 to go beyond the partition 35 and to be fixed, whereby locking with the key 25 becomes possible. When the battery pack 23 is first inserted, the discharge positive electrode terminal 33 of the battery pack 23 and the positive electrode terminal 30 of the mounting part 24 are not connected; however, connection is achieved by subsequent sliding and the connection is secured by the

locking system 36. As shown in FIG. 14 (b), the discharge negative electrode terminal 34 and the negative electrode terminal 31 are designed to be connected by a similar double action system. As shown in FIG. 14 (a), a thermistor terminal 40, a charge positive electrode terminal 41 and the like, to be used during charging, are closed with a lid.

[0038]

Also in the present Example, since the discharge positive electrode terminal 33 and the discharge negative electrode terminal 34 are completely concealed from the outside as evident from FIGS. 13 and 14, lead wires can not be connected thereto. It is therefore impossible to carry out charge from a large-sized battery such as a battery for automobiles using a lead wire.

[0039]

It should be noted that, although the electric bicycle was exemplified in the present Example, a similar effect can be obtained in the case where the power using equipment is an electric motorbike, as long as the battery pack holding part is similarly structured to the present Example.

[0040]

[Effects of the Invention]

As thus described, according to a portable power source system of the present invention, it is possible to provide the mounting structure in which the discharge terminal

is completely concealed and connection with the discharge terminal is achieved by means of the double action system only when a power using equipment is used.

[BRIEF EXPLANATION OF THE DRAWINGS]

[FIG. 1]

An oblique view of a battery pack in accordance with Example 1 of the present invention;

[FIG. 2]

A top plan view of the battery pack in accordance with Example 1 of the present invention;

[FIG. 3]

An oblique view of an electric tool main body in accordance with Example 1 of the present invention;

[FIG. 4]

A vertical sectional view of a battery pack holding part 13 of in accordance with Example 1 of the present invention;

[FIG. 5]

A vertical sectional view of the battery pack holding part 13 in the case where the battery pack is connected to an electric tool main body;

[FIG. 6]

An oblique view of a charger in accordance with Example 1 of the present invention;

[FIG. 7]

A side view of an electric bicycle in accordance

with Example 2 of the present invention;

[FIG. 8]

An oblique view of a battery pack 23 in accordance with Example 2 of the present invention;

[FIG. 9]

An oblique view of a mounting part 24 in accordance with Example 2 of the present invention;

[FIG. 10]

A bottom view of the battery pack 23 in accordance with Example 2 of the present invention;

[FIG. 11]

A sectional view on the line A-A of FIG. 10;

[FIG. 12]

A top plan view in the case where the battery pack 23 is connected to the mounting part 24;

[FIG. 13]

A sectional view on the line B-B of FIG. 12;

[FIG. 14]

(a) A sectional view on the line C-C of FIG. 12;

(b) A sectional view on the line D-D of FIG. 12;

[FIG. 15]

An oblique view of the battery pack (EZ 9025);

[FIG. 16]

A top plan view of the battery pack (EZ 9025); and

[FIG. 17]

A circuit diagram of the battery pack (EZ 9025).

[Explanation of Reference Numerals]

1, 1b, 1c guide

2, 2b latch

3, 3a positive electrode terminal

3b charge positive electrode terminal

4 charge negative electrode terminal

5, 5a discharge negative electrode terminal

6, 6b thermistor terminal

7 secondary battery

8 control circuit

9 thermal protector

10 thermistor

11 driver bit

12 driving part

13 battery pack holding part

14 guide groove

15 groove for a discharge positive electrode terminal

16 groove for a discharge negative electrode terminal

17, 17b positive electrode terminal

18, 18b negative electrode terminal

19 spring

20 internal circuit

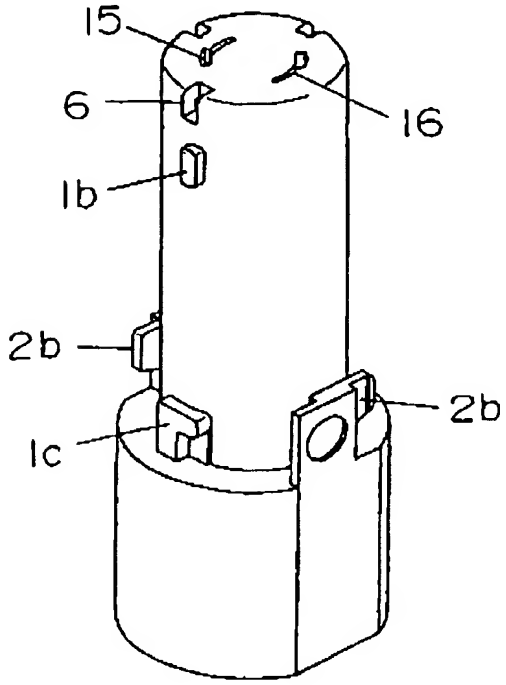
21 saddle

22 sheet tube

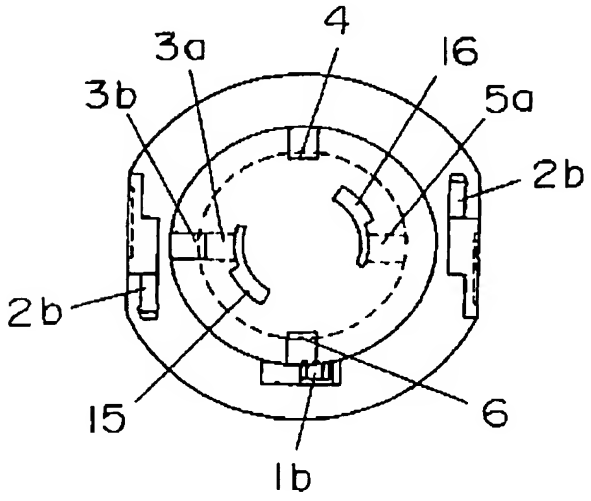
23	battery pack
24	mounting part
25	key
26	guide groove
27	guide
28a, 28b, 28c, 28d, 28e, 28f	concave part
29	hook window
30	positive electrode
31	negative electrode
32	blind plate
33	discharge positive electrode terminal
34	discharge negative electrode terminal
35	partition
36	locking system
37	spring
38	cylinder
39	hook
40	thermistor terminal
41	charge positive electrode terminal

【書類名】 図面 [DOCUMENT NAME] Drawings

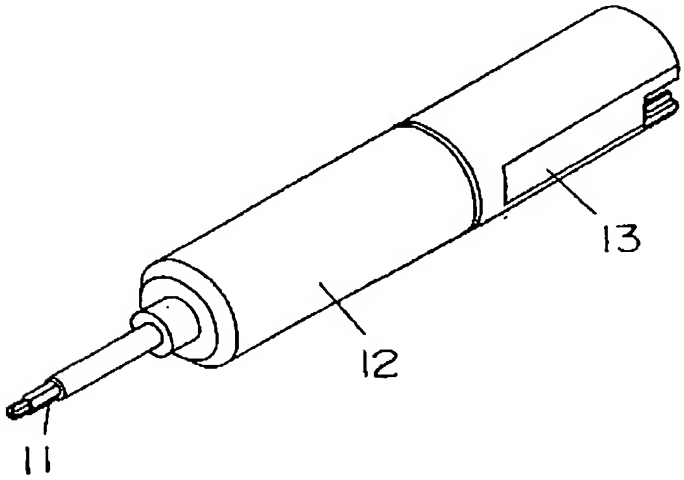
【図１】 [FIG.1]



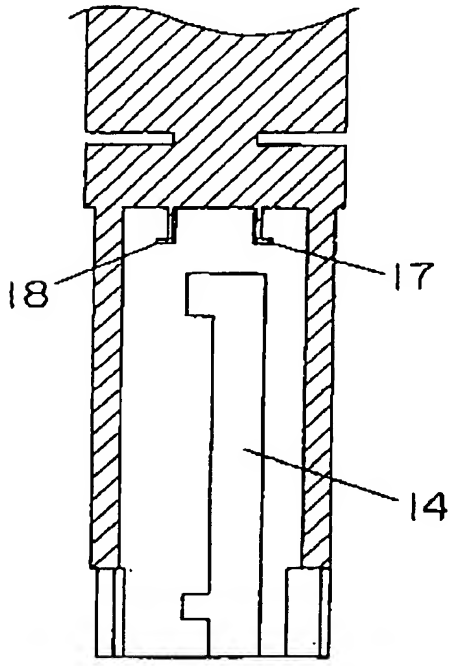
【図２】 [FIG.2]



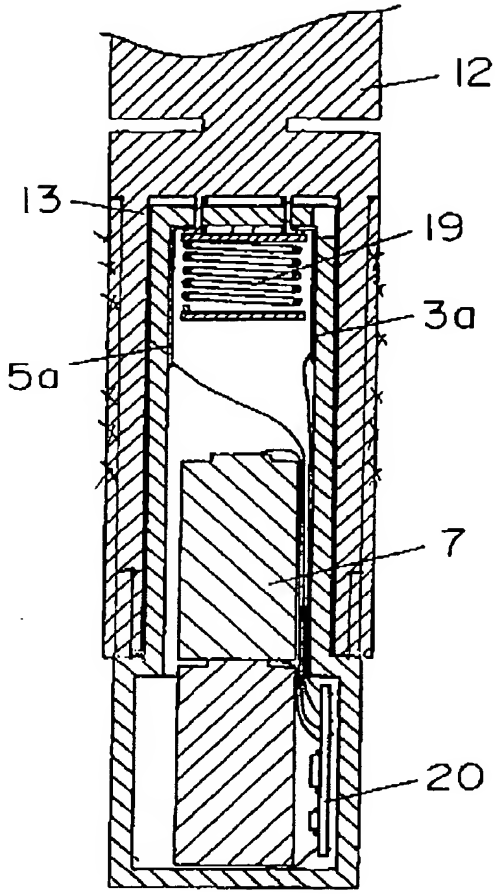
【図３】 [FIG.3]



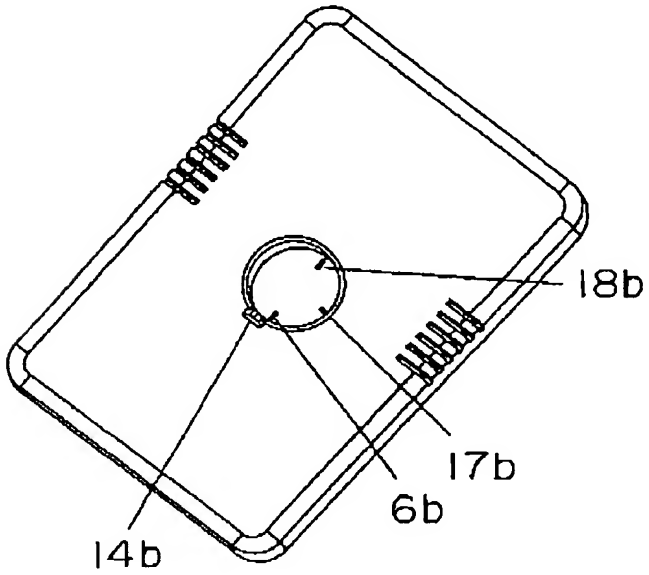
【図４】 [FIG.4]



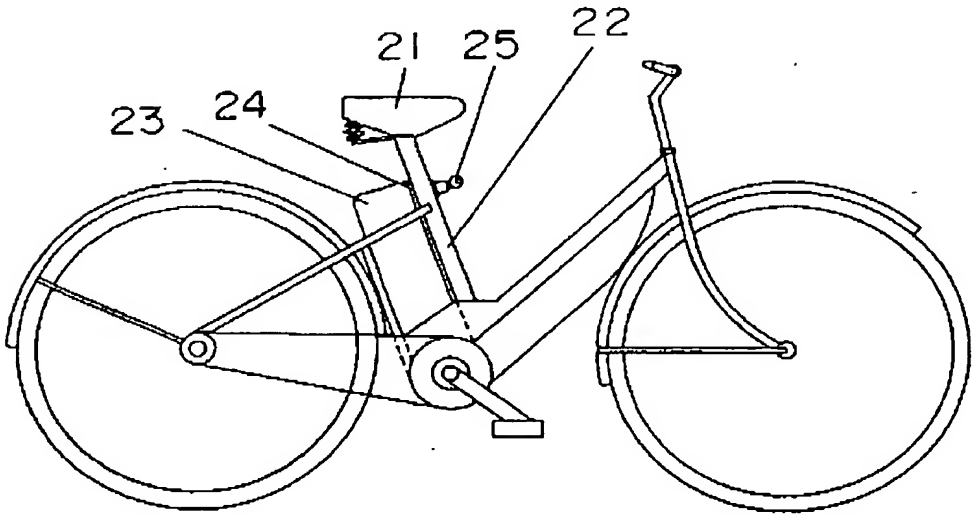
【図５】 [FIG.5]



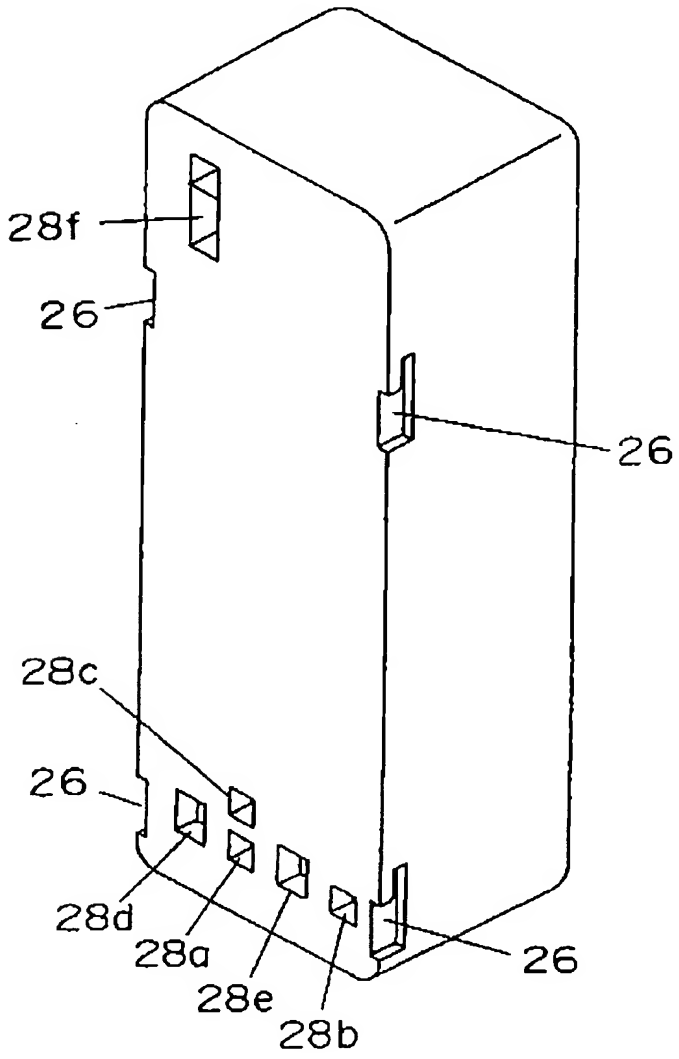
【図６】 [FIG.6]



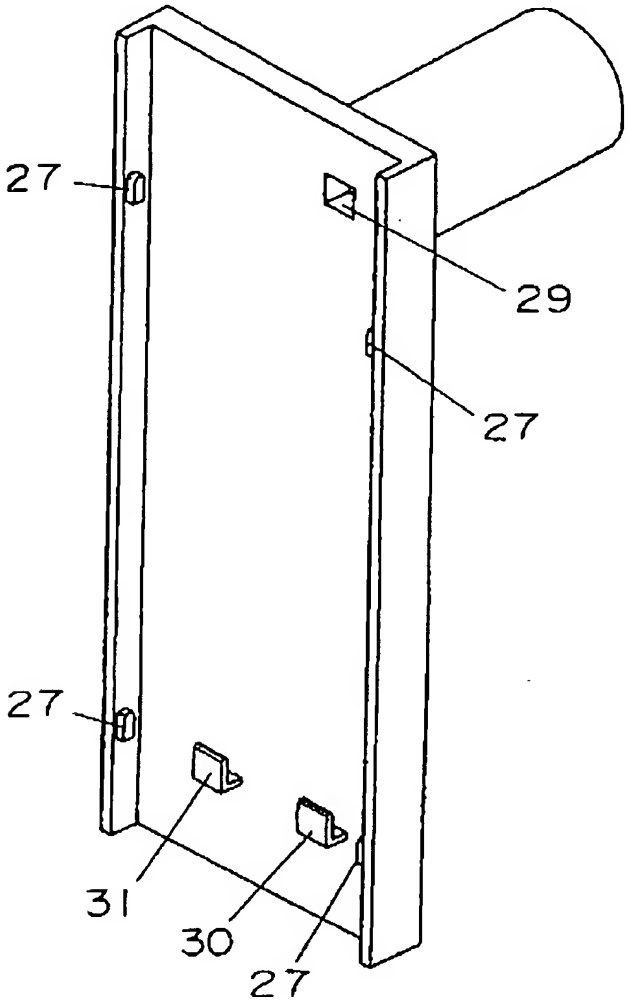
【図７】 [FIG.7]



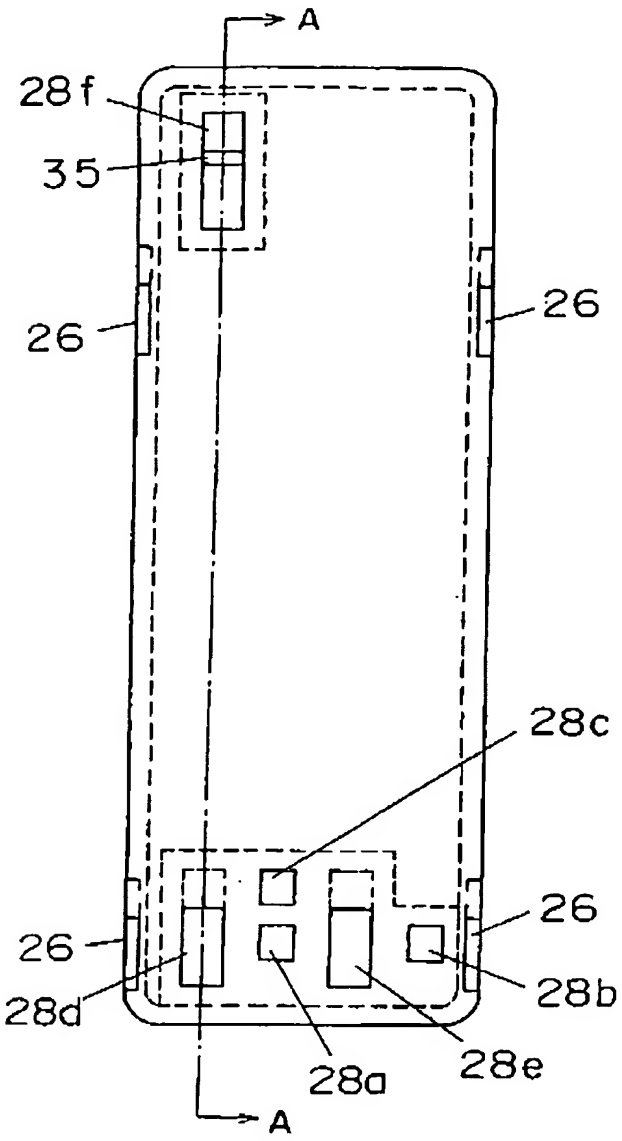
【図8】 [FIG.8]



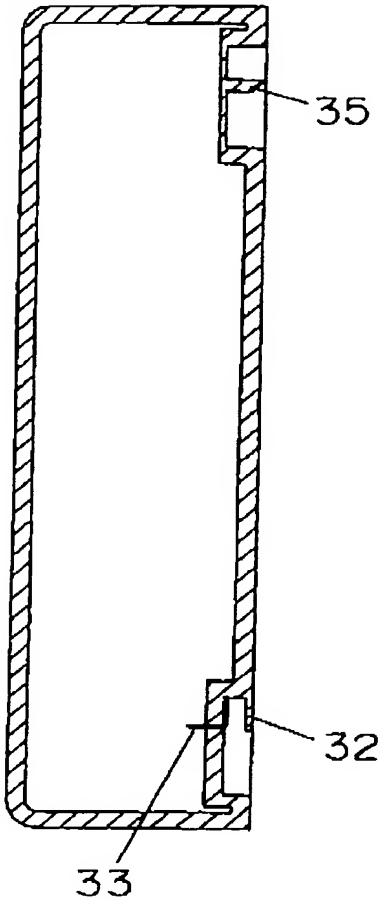
【図９】 [FIG.9]



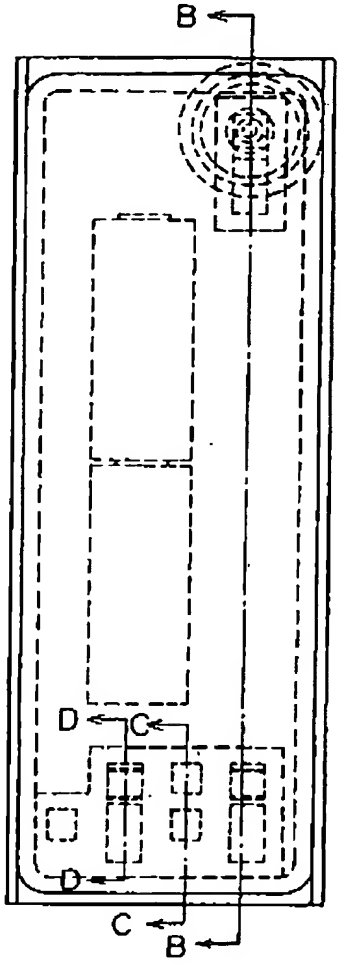
【図１０】 [FIG.10]



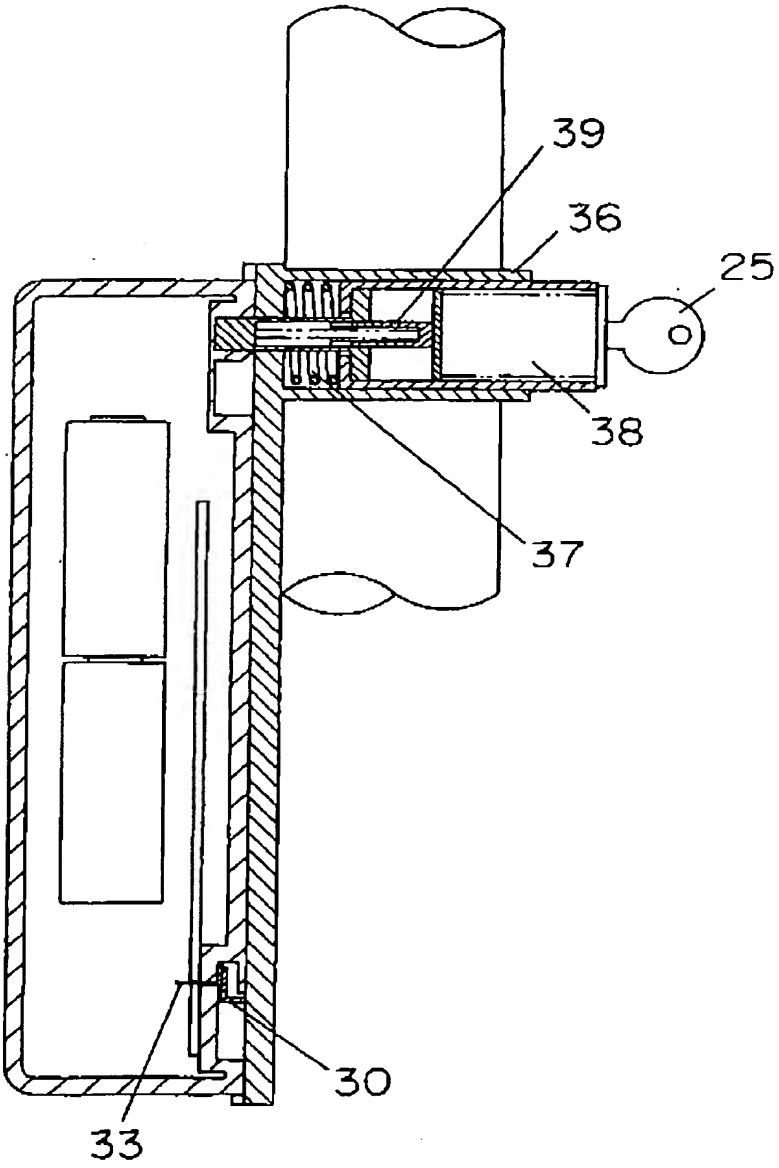
【図１１】 [FIG.11]



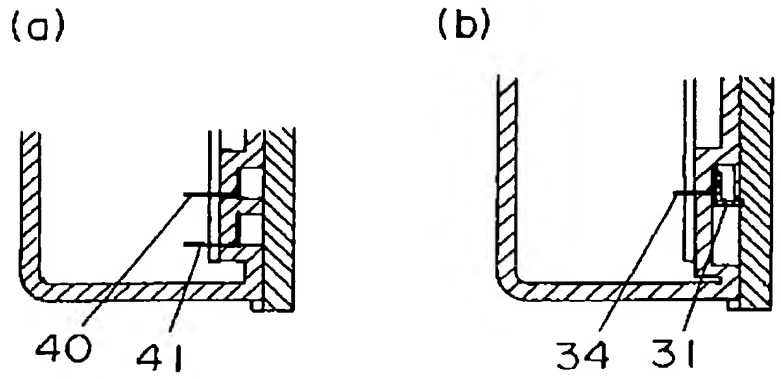
【図１２】 [FIG.12]



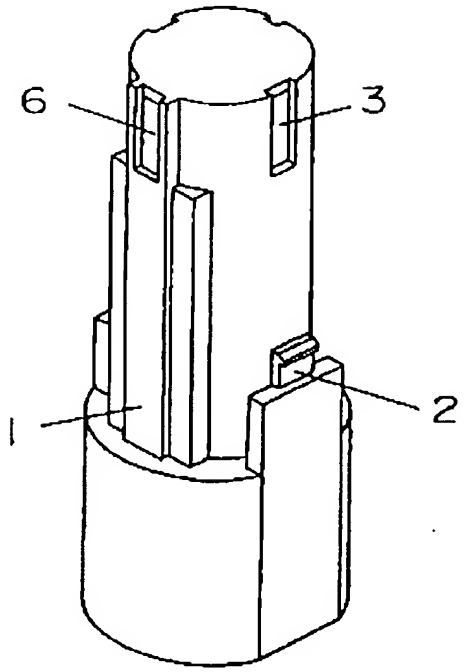
【図１３】 [FIG.13]



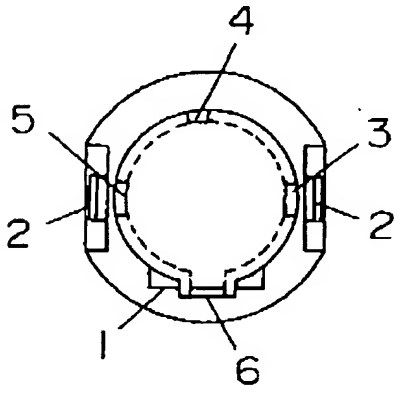
[図１４] [FIG.14]



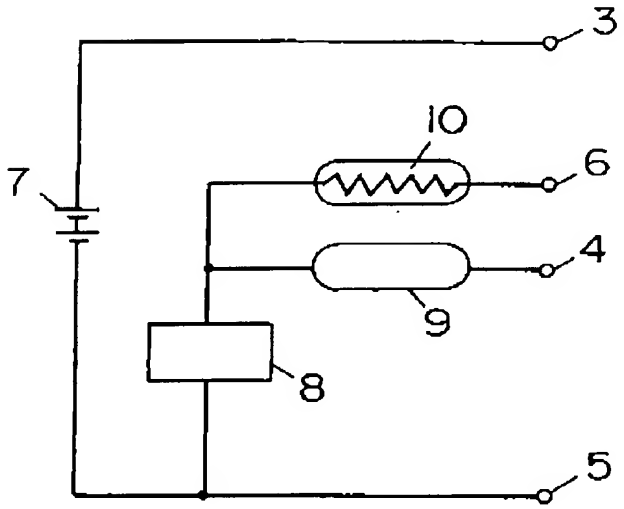
[図１５] [FIG.15]



【図１６】 [FIG.16]



【図１７】 [FIG.17]



2002-206795

(Translation)

[DOCUMENT NAME] Abstract

[ABSTRACT]

[OBJECTIVE] To provide a mounting structure, in which connection with a discharge terminal is achieved only when a power using equipment is used, using a simplified configuration.

[SOLVING MEANS] In the mounting structure of the power using equipment and a battery pack, the mounting structure includes an external terminal having a protruding shape disposed on the power using equipment main body and a discharge terminal having a concave shape disposed on the battery pack, and comprises a double action system in which connection is achieved by inserting the external terminal to the external terminal of the power using equipment main body and then rotating, or alternatively by inserting the external terminal and then sliding in a direction different from the insertion direction.

[SELECTED DRAWING] FIG. 1